



PTO/SB/08a (08-03)
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Substitute for form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary) Sheet 1 Of 1		Complete If Known	
		Application Number	10/849,348
		Filing Date	May 19, 2004
		First Named Inventor	Robert H. Burgener, II
		Group Art Unit	2814
		Examiner Name	Wai Sing Louie
		Attorney Docket Number	3398.2.10

U.S. PATENT DOCUMENTS					
Examiner Initials *	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number - Kind Code ² (if known)			
W/S	U1	US-2004/0061114 A1	04/01/2004	Yan et al.	
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	U3				
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	U5				
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	U7				
	U8				
	U9				
	U10				
	U11				
	U12				
	U13				
	U14				

FOREIGN PATENT DOCUMENTS						
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	F3					
	F4					
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		First Named Inventor	Robert H. Burgener, II
		Group Art Unit	2814
		Examiner Name	Wai Sing Louie
		Attorney Docket Number	3398.2.10

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials *	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
WBL	O1	AULBUR, W.; Density Functional Theory: Basic Ideas & Applications; Ohio State University.	.
	O2	LOOK, D.C., and CLAFLIN, B.; P-type doping and devices based on ZnO; 08/2003; Wiley-VCH Verlag GmbH & Co.	.
	O3	ZUNGER, A.; Practical Doping Principles; NCPV and Solar Program Review Meeting 2003; pp. 831-835.	.
	O4	ZHANG, S.B., WEI, S.H., and ZUNGER, A.; Intrinsic n-type versus p-type doping asymmetry and the defect physics of ZnO; Physical Review B; 01/31/2001; pp. 075205-1 - 075205-7; Volume 63; The American Physical Society.	.
	O5	LIMPIJUMNONG, S., ZHANG, S.B., WEI, S.H., and PARK C.H.; Doping by Large-Size-Mismatched Impurities: The Microscopic Origin of Arsenic- or Antimony-Doped p-Type Zinc Oxide; Physical Review Letters; 04/16/2004; Volume 92, Number 15; The American Physical Society.	.
	O6	YAMAMOTO, T., and KATAYAMA-YOSHIDA, H.; Solution Using a Codoping Method to Unipolarity for the Fabrication of p-Type ZnO; Japanese Journal of Applied Physics; 02/15/1999; pp. L 166-L 169; Volume 38; Japanese Journal of Applied Physics Publication Board.	.
	O7	PARK, C.H., ZHANG, S.B., and WEI, S.H.; Origin of p-type doping difficulty in ZnO: The impurity perspective; Physical Review B; 08/05/2002; pp. 073202-1 - 073202-3; Volume 66; The American Physical Society.	.
	O8	TSUKAZAKI, A., ATSUSHI, T., OHTOMO, A., ONUMA, T., OHTANI, M., MAKINO, T., et al; Repeated temperature modulation epitaxy for p-type doping and light-emitting diode based on ZnO; Nature Materials; 01/2005; pp. 42-46; Volume 4; Nature Publishing Group.	.
	O9	NONAKA, M., MATSUSHIMA, S., MIZUNO, M., and KOBAYASHI, K.; Electronic Structure of Group III Elements Dopes into ZnO by Using Molecular Orbital Calculation; Chemistry Letters 2002; 02/20/2002; pp. 580-581; The Chemical Society of Japan.	.
	O10	WANG, L.G., and ZUNGER, A.; Cluster-Doping Approach for Wide-Gap Semiconductors: The Case of p-type ZnO; Physical Review Letters; 06/27/2003; pp. 256401-1 - 256401-4; Volume 90, Number 25; The American Physical Society.	.
	O11	NORTON, D.P., HEO, Y.W., IVILL, M.P., IP, K., PEARTON, S.J., et al; ZnO: growth, doping and processing; Materialstoday; 06/2004; Elsevier Ltd.	.
	O12	LEE, E-C., KIM, Y.-S., JIN, Y.-G., and CHANG, K.J.; First-Principles Study of p-Type Doping and Codoping in ZnO; Journal of the Korean Physical Society; 12/2001; pp. S23-S26; Volume 39.	.
	O13	MORHAIN, C., TEISSEIRE, M., VEZIAN, S., VIGUE, F., RAYMOND, F., et al; Spectroscopy of Excitons, Bound Excitons and Impurities in h-ZnO Epilayers; 09/30/2001; pp. 881-885; Volume 229, Number 2; Wiley VCH; Berlin.	.
	O14	BANDYOPADHYAY, S., PAUL, G.K., ROY, R., SEN, S.K., and SEN, S.; Study of structural and electrical properties of grain-boundary modified ZnO films prepared by sol-gel technique; Materials Chemistry and Physics; 05/17/2001; pp. 83-91; Volume 74; Elsevier Science B.V.	.

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		Examiner Name	Wai Sing Louie
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Sheet	2	Of	9

WSL	O15	WILKINSON, J., XIONG, G., UCER, K.B., and WILLIAMS, R.T.; Lifetime and Oscillator Strength of Excitonic Luminescence in Zinc Oxide; Department of Physics, Wake Forest University, Winston-Salem, NC.	.
	O16	KOBAYASHI, A., SANKEY, O.F., and DOW, J.D.; Deep energy levels of defects in the wurtzite semiconductors AlN, CdS, CdSe, and ZnO; Physical Review B; 07/15/1983; pp. 946-956; Volume 28, Number 2; The American Physical Society.	.
	O17	DANEU, N., REENIK, A., and BERNIK, S.; Grain Growth Control in Sb ₂ O ₃ -Doped Zinc Oxide; Journal of the American Ceramic Society; 2003; pp. 1379-1384; Volume 86, Number 8.	.
	O18	OHYAMA, M.; Sol-Gel Preparation of Transparent and Conductive Aluminum-Doped Zinc Oxide Films with Highly Preferential Crystal Orientation; Journal of the American Ceramic Society; 1998; pp. 1622-1632; Volume 81, Number 6.	.
	O19	DUAN, X.L., YUAN, D.R., CHENG, X.F., SUN, H.Q., SUN, Z.H., et al; Microstructure and Properties of Co ²⁺ ZnAl ₂ O ₄ /SiO ₂ Nanocomposite Glasses Prepared by Sol-Gel Method; Journal of the American Ceramic Society; 2005; pp. 399-403; Volume 88, Number 2.	.
	O20	SOHN, K.S., HWANG, D.K., and MYOUNG, J.M.; Time Integrated/Resolved Photoluminescence of ZnO Films Deposited on Sapphire and GaAs; Japanese Journal of Applied Physics; 12/2003; pp. 7376-7378; The Japan Society of Applied Physics.	.
	O21	SUN, X.W.; Optical properties of epitaxially grown zinc oxide films on sapphire by pulsed laser deposition; Journal of Applied Physics; 07/01/1999; pp. 408-411; Volume 86, Number 1; American Institute of Physics.	.
	O22	BURDEN, A.P., BISHOP, H.E., BRIERLEY, M., FRIDAY, J.M., HOOD, C., et al.; Incorporating consumer-priced field emitting inks into arrays of triode devices; Solid State Electronics; 2001; pp. 987-996; Vol. 45; Printable Field Emitters Ltd.	.
	O23	MINAMI, T., MIYATA, T., SHIRAI, T., and NAKATANI, T.; Electroluminescent Oxide Phosphor Thin Films Prepared by a Sol-gel Process; Mat. Res. Soc. Symp. Proc.; 2000; pp. Q4.3.1 - Q4.3.6; Vol. 621; Materials Research Society.	.
	O24	QIU, C., CHEN, H., WONG, M., and KWOK, H.S.; Dependence of the Current and Power Efficiencies of Organic Light-Emitting Diode on the Thickness of the Constituent Organic Layers; IEEE Transactions On Electron Devices; 09/2001; pp. 2131-2137; Vol. 48; IEEE.	.
	O25	MATSUDA, T., KAWABE, M., IWATA, H., and OHZONE, T.; Visible Electroluminescence from MOS Capacitors with Si-Implanted SiO ₂ ; IEICE Trans. Electron.; 09/11/2002; pp. 1895-1904; Vol. E85-C, No. 11.	.
	O26	ONG, H.C., LI, A.S.K., and DU, G.T.; Depth profiling of ZnO thin films by cathodoluminescence; Applied Physics Letters; 04/30/2001; pp. 2667-2669; Vol. 78, No. 18; American Institute of Physics.	.
	O27	WASHINGTON, P.L., ONG, H.C., DAI, J.Y., and CHANG, R.P.H.; Determination of the optical constants of zinc oxide thin films by spectroscopic ellipsometry; Applied Physics Letter; 06/22/1998; pp. 3261-3263; Vol. 72, No. 25; American Institute of Physics.	.
	O28	SEKIGUCHI, T., OHASHI, N., and YAMANE, H.; Cathodoluminescence Study on ZnO and GaN; Solid State Phenomena; 1998; pp. 171-182; Vols. 63-64; Scitac Publications; Switzerland.	.
✓	O29	KOUYATE, D., RONFARD-HARET, J.-C., and KOSSANYI, J.; Photo- and electro-luminescence of rare earth-doped semiconducting zinc oxide electrodes: Emission from both the dopant and the support; Journal of Luminescence; 1991; pp. 205-210; Vol. 50; Elsevier Science Publishers B.V.	.

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Sheet	3	Of	9

WSL	O30	KOSSANYI, J., KOUYATE, D., POULIQUEN, J., RONFARD-HARET, J.C., VALAT, P., et al.; Photoluminescence of Semiconducting Zinc Oxide Containing Rare Earth Ions as Impurities; Journal of Luminescence; 1990; pp. 17-24; Vol. 46; Elsevier Science Publishers B.V. (north-Holland).	.
	O31	WANG, Y.G., LAU, S.P., LEE, H.W., YU, S.F., TAY, B.K., et al.; Photoluminescence study of ZnO films prepared by thermal oxidation of Zn metallic films in air; Journal of Applied Physics; 07/01/2003; pp. 354-358; Vol. 94, No. 1; American Institute of Physics.	.
	O32	YU, S.F., YUEN, C., LAU, S.P., WANG, Y.G., LEE, H.W., et al.; Ultraviolet amplified spontaneous emission from zinc oxide ridge waveguides on silicon substrate; Applied Physics Letter; 11/24/2003; pp. 4288-4290; Vol. 83, No. 21; American Institute of Physics.	.
	O33	XIONG, G., WILKINSON, J., LYLES, J., UCER, K.B., and WILLIAMS, R.T.; Luminescence and stimulated emission in zinc oxide nanoparticles, films, and crystals.	.
	O34	ONG, H.C., DAI, J.Y., and DU, G.T.; Studies of electronic structure of ZnO grain boundary and its proximity by using spatially resolved electron energy loss spectroscopy; Applied Physics Letter; 07/08/2002; pp. 277-279; Vol. 81, No. 2; American Institute of Physics.	.
	O35	AGNE, T., GUAN, Z., LI, X.M., WOLF, H., and WICHERT, T.; Incorporation of the Donor Indium in Nanocrystalline ZnO; phys. stat. sol.; 2002; pp. 819-823; Vol. 229; WILEY-VCH Verlag Berlin GmbH; Berlin.	.
	O36	QADRI, S.B., KIM, H., HORWITZ, J.S., and CHRISEY, D.B.; Transparent conducting films of ZnO-ZrO ₂ : Structure and properties; Journal of Applied Physics; 12/01/2000; pp. 6564-6566; Vol. 88, No. 11; American Institute of Physics.	.
	O37	HAN, J., MANTAS, P.Q., and SENOS, A.M.R.; Grain growth in Mn-doped ZnO; Journal of the European Ceramic Society; 2000; 2753-2758; Vol. 20.	.
	O38	JIN, Y., ZHANG, B., YANG, S., WANG, Y., CHEN, J., et al.; Room temperature UV emission of Mg _{0.9} Zn _{0.1} O films; Solid State Communications; 2001; pp. 409-413; Vol. 119; Elsevier Science Ltd.	.
	O39	PETRIK, N.G., ALEXANDROV, A.B., and VALL, A.I.; Interfacial Energy Transfer during Gamma Radiolysis of Water on the Surface of ZrO ₂ and Some Other Oxides; J. Phys. Chem. B; 2001; pp. 5935-5944; Vol. 105; American Chemical Society.	.
	O40	COUNIO, G., ESNOUF, S., GACOIN, T., and BOILLOT, J.-P.; CdS:Mn Nanocrystals in Transparent Xerogel Matrices: Synthesis and Luminescence Properties; J. Phys. Chem.; 1996; pp. 20021-20026; Vol. 100; American Chemical Society.	.
	O41	STRAVREV, K., KYNEV, K., ST. NIKOLOV, G., and DYAKOVITCH, V.A.; Semiempirical Assignment of the Electron Transitions in Manganese(II)-Doped II-VI Compounds; J. Phys. Chem. Solids; 1987; pp. 841-844; Vol. 48, No. 9; Pergamon Journals Ltd.	.
	O42	FALCONY, C., ORTIZ, A., DOMINGUEZ, J.M., FARIAS, M.H., COTA-ARAIZA, L. et al.; Luminescent Characteristics of Tb Doped Al ₂ O ₃ Films Deposited by Spray Pyrolysis; J. Electrochem Soc.; 01/1992; pp. 267-271; Vol. 139, No. 1; The Electrochemical Society, Inc.	.
	O43	BACHIR, S., KOSSANYI, J., SANDOJLY, C., VALAT, P., and RONFARD-HARET, J.C.; Electroluminescence of Dy ³⁺ and Sm ³⁺ Ions in Polycrystalline Semiconducting Zinc Oxide; J. Phys. Chem; 1995; pp. 5674-5679; Vol. 99; American Chemical Society.	.
	O44	BACHIR, S., KOSSANYI, J., and RONFARD-HARET, J.C.; Electroluminescence of Ho ³⁺ Ions in a ZnO Varistor-Type Structure; Solid State Communications; 1993; pp. 859-863; Vol. 89, No. 10; Elsevier Science Ltd.; Great Britain.	.
✓	O45	CHAKRABARTI, S., GANGULI, D., CHAUDHURI, S., and PAL, A.K.; Crystalline magnesium oxide films on soda lime glass by sol-gel processing; Materials Letters; 05/2002; pp. 120-123; Vol. 54; Elsevier Science B.V.	.

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		Examiner Name	Wai Sing Louie
		Attorney Docket Number	3398.2.10
Sheet	4	Of	9

✓	O46	ARKLES, B.; Commercial Applications of Sol-Gel-Derived Hybrid Materials; MRS Bulletin; 05/2001; pp. 402-407.	✓
✓	O47	MURRAY, C.E., NOYAN, I.C., and MOONEY, P.M.; Mapping of strain fields about thin film structures using x-ray microdiffraction; Applied Physics Letters; 11/17/2003; pp. 4163-4165; Vol. 83, No. 20; American Institute of Physics.	✓
✓	O48	MODENA, S., SORARU, G.D., BLUM, Y., and RAJ, R.; Passive Oxidation of an Effluent System: The Case of Polymer-Derived SiCO; Journal of the American Ceramic Society; 2005; pp. 339-345; Vol. 88.	✓
✓	O49	NOYAN, I.C., WANG, P.-C., KALDOR, S.K., and JORDAN-SWEET, J.L.; Deformation field in single-crystal fields semiconductor substrates caused by metallization features; Applied Physics Letters; 04/19/1999; pp. 2352-2354; Vol. 74, No. 16; American Institute of Physics.	✓
✓	O50	NOYAN, I.C., JORDAN-SWEET, J., LINIGER, E.G., and KALDOR, S.K.; Characterization of substrate-thin-film interfaces with x-ray microdiffraction; Applied Physics Letters; 06/22/1998; pp. 3338-3340; Vol. 72, No. 25; American Institute of Physics.	✓
✓	O51	TULLER, H.L.; ZnO Grain Boundaries: Electrical Activity and Diffusion; Journal of Electroceramics; 1999; pp. 33-40; Vol. 4:S1; Kluwer Academic Publishers; Boston.	✓
✓	O52	WESTIN, G., EKSTRAND, A., NYGREN, M., OSTERLUND, R., and MERKELBACH, P.; Preparation of ZnO-based Varistors by the Sol-Gel Technique; J. Mater. Chem.; 1994; pp. 615-621; Vol. 4.	✓
✓	O53	WANG, M., YANG, X., and WANG, F.; Properties of Sensitive Materials Mainly Composed of ZnO; J. Mater. Sci. Technol.; 2000; p. 204; Vol. 16, No. 2.	✓
✓	O54	BAPTISTA, J.L., and MANTAS, P.Q.; High Temperature Characterization of Electrical Barriers in ZnO Varistors; Journal of Electroceramics; 2000; pp. 215-224; Vol. 4:1; Kluwer Academic Publishers; The Netherlands.	✓
✓	O55	BRANKOVIC, Z., BRANKOVIC, G., POLETI, D., and VARELA, J.A.; Structural and electrical properties of ZnO varistors containing different spinel phases; Ceramics International; 2001; pp. 115-122; Vol. 27; Elsevier Science Ltd. And Techna S.r.l.	✓
✓	O56	TANAKA, A., and MUKAE, K.; Evaluation of Single Grain Boundaries in ZnO: Rare-Earth Varistor by Micro-Electrodes; Key Engineering Materials; 1999; pp. 235-240; Vols. 157-158; Trans Tech Publications, Switzerland; CSJ Series-Publications of the Ceramic Society of Japan Vol. 1, The Ceramic Society of Japan.	✓
✓	O57	PANDEY, R., JAFFE, J.E., and KUNZ, A.B.; Ab initio band-structure calculations for alkaline-earth oxides and sulfides; Physical Review B; 04/15/1991; pp. 9228-9237; Vol. 43, No. 11; The American Physical Society.	✓
✓	O58	CANNEY, S.A., SASHIN, V.A., FORD, M.J., and KHEIFETS, A.S.; Electronic band structure of magnesium and magnesium oxide: experiment and theory; J. Phys. Condens. Matter; 1999; pp. 7507-7522; Vol. 11; IOP Publishing Ltd.	✓
✓	O59	YAMASAKI, A., and FUJIWARA, T.; Electronic structure of the MO oxides (M=Mg, Ca, Ti, V) in the GW approximation; Physical Review B; 2002; pp. 245108-1 - 245108-9; Vol. 66; The American Physical Society.	✓
✓	O60	MIKAJLO, E.A., SASHIN, V.A., NIXON, K.L., SEOULE DE BAS, B., DORSETT, H.E., and FORD, M.J.; Band Structures of the Group I and II Oxides: Using EMS Measurements as a Test of Theoretical Models.	✓
✓	O61	JOHNSON, P.D.; Some Optical Properties of MgO in the Vacuum Ultraviolet; Physical Review; 05/15/1954; pp. 845-846; Vol. 94, No. 4.	✓

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		First Named Inventor	Robert H. Burgener, II
		Group Art Unit	2814
		Examiner Name	Wai Sing Louie
		Attorney Docket Number	3398.2.10
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WSL	O62	NARAZAKI, A., TANAKA, K., HIRAO, K., HASHIMOTO, T., NASU, H., et al.; IR and XPS Studies on the Surface Structure of Poled ZnO-TeO ₂ Glasses with Second-Order Nonlinearity; Journal of the American Ceramic Society; 2001; pp. 214-217; Vol. 84.	
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✓	O77	NAKAHARA, K., TANABE, T., TAKASU, H., FONS, P., IWATA, K., et al.; Growth of undoped ZnO Films with Improved Electrical Properties by Radical Source Molecular Beam Epitaxy; Japanese Journal of Applied Physics; 2001; pp. 250-254; Vol. 40; The Japan Society of Applied Physics.	

Examiner Signature		Date Considered	5/24/06
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		Attorney Docket Number	3398.2.10
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W82	O78	WANG, X., DU, G., GU, C., JIA, J., LI, X., et al.; Two-step growth of ZnO thin films on diamond/Si low-pressure metal-organic chemical vapour deposition; J. Phys. D: Appl. Phys.; 2002; pp. L74-L76; Vol. 35; IOP Publishing Ltd., United Kingdom.	✓
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	O90	TEKE, A., OZGUR, U., DOGAN, S., GU, X., MORKOC, H., et al.; Excitonic fine structure and recombination dynamics in single-crystalline ZnO; Physical Review B; 2004; pp. 195207-1 - 195207-10; Vol. 70; The American Physical Society.	✓
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		Examiner Name	Wai Sing Louie
		Attorney Docket Number	3398.2.10
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WBL	O94	SENGER, R.T., and BAJAI, K.K.; Binding energies of excitons in polar quantum well heterostructures; Physical Review B; 2003; pp. 205314-1-205314-9; Vol. 68; The American Physical Society.	✓
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	O103	NORMAN, A.G., OLSON, J.M., ROMERO, M.J., and AL-JASSIM, M.M.; Electron Microscopy Studies of Potential 1-eV Bandgap Semiconductor Compounds AnGeAs ₂ and Zn ₃ As ₂ Grown by MOVPE; National Renewable Energy Laboratory.	✓
	O104	MILES, G.C., and WEST, A.R.; Polymorphism and Thermodynamic Stability of Zn ₇ As ₂ O ₁₂ ; Journal of the American Ceramic Society; 2005; pp. 396-398; Vol. 88.	✓
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	O107	XIONG, G., WILKINSON, J., MISCHUCK, B., TUZEMEN, S., UCER, K.B., et al.; Control of p- and n-type conductivity in sputter deposition of undoped ZnO; Applied Physics Letters; 02/18/2002; pp. 1195-1197; Vol. 80, No. 7; American Institute of Physics.	✓
	O108	LOOK, D.C., RENLUND, G.M., BURGNER, II, R.H., and SIZELOVE, J.R.; As-doped p-type ZnO produced by an evaporation/sputtering process; Applied Physics Letters; 11/2004; Vol. 85.	✓
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		Attorney Docket Number	3398.2.10
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✓	O110	LEE, J.-M., KIM, K.K., PARK, S.-J., and CHOI, W.K.; Low-resistance and non-alloyed ohmic contacts to plasma treated ZnO; Applied Physics Letters; 06/11/2001; pp. 3842-2844; Vol. 78, No. 24; American Institute of Physics.	.
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✓	O124	The Promise of Solid State Lighting for General Illumination: Light Emitting Diodes (LEDs) and Organic Light Emitting Diodes (OLEDs); 2001; pp. 1-29; Optoelectronics Industry Development Association, Washington, D.C.	.
	O125	TALBOT, D.; LEDs vs. the Light Bulb; Technology Review; 05/2003; pp. 30-36.	.

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WSL	O126	JOHNSON, S.; LEDs—An Overview of the State of the Art in Technology and Application; Light Right 5 Conference, May 27-31, 2002, Nice, France.	
	O127	TUZEMEN, S., XIONG, G., WILKINSON, J., MISCHICK, B., UCER, K.B., et al.; Production and properties of p-n junctions in reactively sputtered ZnO; Physica B; 2001; pp. 1197-1200; Vol. 308-310; Elsevier Science B.V.	
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	O139	Chapter 2 Geometric Structure of Metal Oxides; pp. 55-58.	
	O140	Chapter 4 Electronic Structure of Non-Transition-Metal-Oxide Surfaces; pp. 143-150.	
✓	O141	IP, K., KHANNA, R., NORTON, D.P., PEARTON, S.J., REN, F., et al.; Thermal Stability of Tungsten-Based Schottky Contacts to N-Type ZnO.	

Examiner Signature		Date Considered	5/21/06
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¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

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